

more broadly spaced dorsal barring, and in the brighter red rump and upper tail-coverts; slightly larger in wing length.

Measurements of type: wing 48; tail 45; tarsus 15; bill 10.

Range: Lowlands of the eastern Congo from Tshuapa and Ituri districts south to Kasai, and extreme northeast Angola.

Remarks: The eastern race *graueri* resembles *atricapilla* of West Africa more nearly than it does the intervening *avakubi*. Both are finely barred above, but *graueri* is paler on cheeks and throat than *atricapilla*, and rump and upper tail-coverts are a darker red. There seems to be a real gap between the ranges of *atricapilla* and *avakubi*, for the species is not known from along the middle Congo River or in Moyen Congo.

Variation in size is not great. Within *atricapilla* Gabon birds are smaller than those from Cameroon; *avakubi* is similar to the Cameroon populations, and *graueri* is somewhat smaller. Comparative wing measurements are:

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<i>atricapilla</i> —Gabon	(5)	45–47 (45.8)		45, 45, 47
Cameroon	(7)	47–49 (47.7)	(8)	46–47 (46.6)
<i>avakubi</i>	(4)	47–48 (47.5)		46, 47
<i>graueri</i>		45, 46		

Some observations of bird behaviour made from an aircraft in the Serengeti National Park

by M. I. M. TURNER

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The Tanganyika National Parks are among the foremost users of light aircraft in game management work in Africa, and the following notes are drawn from over 700 hours flying experience in the Serengeti National Park during the years 1961–1963 while on normal Game and Administrative duties.

Undoubtedly among the greatest hazards to aerial work over the game areas in Africa are the great birds of prey, and, here in the Serengeti with its estimated 1,000,000 head of ungulates, the concentration of vultures and eagles is very large. Six species of vulture exist in the Park as follows: Rüppell's Griffon (*Gyps rüppellii*), White-backed Vulture (*Pseudogyps africanus*), Lappet-faced Vulture (*Torgos tracheliotus*), White-headed Vulture (*Trigonoceps occipitalis*), Egyptian Vulture (*Neophron percnopterus*) and Hooded Vulture (*Necrosyrtes monachus*). These great birds, weighing 12–15 lbs., can be encountered at any altitude between ground level and as high as 12,000 ft., and are ever in attendance on the great migratory concentrations of wildebeeste and zebra throughout the Park. Vultures are poor fliers and rely in Africa almost entirely on ascending thermal currents to gain height to carry out their daily patrolling, ever searching for dead and dying animals. In the mountainous areas of the Ngorongoro highlands adjoining the South East boundary of the Serengeti, the high winds are used by vultures to the same effect. In the early morning or late evening most of the larger birds of prey are effectively grounded by the thinner, cooler air. In the dry weather and in open country, vultures

are rarely aloft before 9 a.m. unless there is a strong wind, and it is interesting to see these birds resting on the great granite inselbergs in the treeless central plains areas in the morning, waiting for the rocks to heat up, causing thermals which will allow them to climb. Once aloft they would have to find food before 5 p.m. when the cooler air forces them to descend. In wet weather vultures are grounded for most of the day, but in dry weather, having once gained soaring height on a thermal they may cover many miles before descending. When flying, with practice one can easily spot vultures straight ahead up to three miles away. Great care should be taken when vultures are seen diving on a carcass diagonally across the path of the plane, as usually more are following from above and may be in the "dead" spot above the wing and therefore unseen. It is interesting to note that vultures will not avoid an aircraft until the last moment, and it is well never to count on them doing so. Flying up behind, and to one side of a soaring vulture, it is interesting to note the bird's reaction. Usually a scraggy neck turns and a beady eye calmly surveys the aircraft—an interloper in their element! The "blind spots" in a normal high wing light aircraft are below the engine cowling and above the wings, and it is usually from these directions that one's biggest danger comes. The author of this article had a vulture come up from below the port wing, was first seen at 10 ft. from the aircraft, and the bird passed between the strut and the fuselage at great speed.

As well as vultures many species of the larger eagles inhabit the Serengeti, one of the most common being the Bateleur Eagle (*Terathopius ecaudatus*). This soaring eagle with its distinctive black and chestnut upper parts, brown shoulders, very short tail and red face and feet is probably the finest aerobatic flyer of all the larger birds of prey, and generally easily avoids an aircraft before the pilot has taken any action himself. To see a Bateleur do a 90° turn, roll and dive in one movement is an unforgettable experience. Other powerful eagles commonly met up to 2,000 ft. are the Martial Eagle (*Polemaëtus bellicosus*) and the Tawny Eagle (*Aquila rapax*).

One of the common palaeartic winter migrants to Africa is the White Stork (*Ciconia ciconia*) and every year great flocks of these pass over most of East Africa on their way south. Great care should be taken when they are encountered in the air. At considerable heights, sometimes up to 12,000 ft., it is quite easy to fly unknowingly underneath a flock, and when disturbed the evasive action of these storks is, to say the least, disconcerting. Dropping their legs and closing their wings, they fall like stones, and to be directly underneath a flock with birds plummeting past the plane in every direction is an unforgettable experience. However, flocks can usually be spotted ahead by their colour and the flash of the sun on their wings. In 1960 a White Stork was collected at Seronera bearing the ring of the Russian Marking Station of Beloviezha where it had been ringed as a nestling in 1959.

Another large bird often encountered at great heights, but easily avoided due to its slow flying, size and coloration, is the Pink-backed Pelican (*Pelecanus rufescens*) forever flying between the great lakes system of the Rift Valley which borders the Serengeti. It is interesting to fly past a flock and to note the regular slow beat of their powerful wings and the head held well back like a Heron.

Much of the flying in the Serengeti is done at below 1,000 ft., and it is at these lower levels that the following species are commonly encountered. Yellow-throated Sandgrouse (*Eremialector gutturalis*) at times feed on the Central Plains area of the Park in large flocks and seem to have an extremely slow take off and evasive action.

Crowned Lapwing (*Stephanibyx coronatus*) are often met with up to 500 ft., and it is sometimes disconcerting to see the Flappet Lark (*Mirafra rufocinnamomea*) suddenly appear in front of the aircraft, poised in the air at the top of his mating flight, to drop like a stone as one passes.

In December and January great flocks of Red-billed Quelea (*Quelea quelea*) can be seen feeding in the stands of wild sorghum grass on the Central Plains in the South Western area of the Serengeti. In the early morning, one sees a great wave of birds flying in a long line about 60 ft. above the ground, numbering sometimes hundreds of thousands, resembling smoke or light cloud in the sky.

Up to 1,000 ft. great flocks of the large Mottled Swifts (*Apus equatorialis*) are often seen. Due to the speed of these birds no evasive action is possible and one merely sits tensely at the controls watching swifts disappearing under the engine cowling and wings at tremendous speed seeming practically to turn themselves inside out in their efforts to avoid the aircraft, and such is their remarkable aerobatic ability that they rarely collide with it. At lower levels near cliff faces and inselbergs, large flocks of Little Swifts (*Apus affinis*) are often encountered up to 100 ft. above the ground.

Finally it is not unusual to meet the Secretary Bird (*Sagittarius serpentarius*) gliding in wide circles up to 500 ft. altitude, probably on mating display flight. Recently a D.C.3 collided with one of these birds at Seronera aerodrome, resulting in a shattered windshield and badly buckled cabin roof. The reaction of Ostrich (*Struthio camelus*) to low flying aircraft is interesting. Invariably they puff out their wings and display, meanwhile turning in every direction, as if trying to locate the noise.

Breeding records of the larger birds of prey are easily noted from low flying light aircraft. The vultures and eagles usually nest in the top of the *Acacia tortorlis* and yellow fever trees which abound in most areas of the Serengeti, and these nests, impossible to reach from the ground, are easily spotted from the air by the white droppings which cover the branches near the nest. A first record for the Park of the breeding of the Saddle-billed Stork (*Ephippiorhynchus senegalensis*) was discovered in this way.

In conclusion I would like to record my thanks to Mr. R. M. Watson, pilot of the Serengeti Research Project, in whose company many of these observations were made.

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Alcedo quadibrachys and *A. semitorquata* in the North-Western Province of Northern Rhodesia

by C. W. BENSON

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My assistant Jali Makawa accompanied G. Bell-Cross on a tour of the North-Western Province in October, 1963, collecting on behalf of the Rhodes-Livingstone Museum, and I am most grateful to Bell-Cross for the